REMARKS

This application has been reviewed in light of the Office Action dated April 28, 2006. Claims 1-12 are presented for examination, of which Claim 1 is in independent form. Claims 1-3, 5, 7, 8 and 10-12 have been amended to define still more clearly what Applicant regards as his invention. Favorable reconsideration is requested.

The specification has been amended to conform the Summary of Invention section to the amended claims.

Claims 1, 2, 4, 5 and 7-12 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent Application Publication No. 2003/0025160 A1 (Suzuki). In addition, Claims 3 and 6 were rejected under 35 U.S.C. § 103(a) as being obvious over Suzuki.

As shown above, Applicant has amended independent Claim 1 in terms that more clearly define what he regards as his invention. Applicant submits that this amended independent claim, together with the remaining claims dependent thereon, are patentably distinct from the cited prior art for at least the following reasons.

Claim 1 is directed to a back side incident type fingerprint sensor. The front side of a semiconductor substrate of the fingerprint sensor has a photoelectric conversion portion and an electric circuit. The back side of the semiconductor substrate of the fingerprint sensor has an opening through which a light containing infrared radiation is incident. The incident light containing infrared radiation is detected by the photoelectric conversion portion formed on the front side of the semiconductor substrate. A distance, in the direction parallel to the semiconductor substrate, between the electric circuit on the front side of the semiconductor substrate and an edge of the opening on the back side of the semiconductor substrate is 0.303

times the thickness of the semiconductor substrate or more. By virtue of the recited structure, a compact device structure is provided. In addition, the problem encountered in fingerprint sensors of the prior art of light incident in the semiconductor being diffused onto the peripheral electric circuit is avoided by the positioning of the electrical circuit relative to the aperture.

The present invention is based on (1) a discovery that the light incident in a backside of the semiconductor substrate that reaches the front side on which the peripheral circuit is disposed, is mainly infrared radiation and (2) on research relating to the diffusion of the infrared radiation within the semiconductor substrate (See, Fig. 6 and line 17 on page 6 through line 27 on page 7). For example, when the thickness of the semiconductor substrate is 10 μm, the distance in parallel to the semiconductor substrate between the aperture edge and the peripheral circuit would be desirably 10 X 0.303 = 3.03 μm according to the structure recited in Claim 1.[1] This solution would provide both of an advantage of a compact device structure and of preventing the stray light from being incident in the peripheral circuit.

Suzuki relates to a back side incident type sensor. However, the sensor of Suzuki is a general solid state image pickup device such as CCD sensor, not a "fingerprint sensor" as recited in Claim 1. As shown in Fig. 3 of Suzuki, a micro lens 36 is disposed at an aperture. Accordingly, an incident light is not diffused and converged on photodiode 37. Thus, the problem of the incident light diffused onto the peripheral circuit is not raised in Suzuki and, therefore, it is unnecessary to position the peripheral circuit relative to the aperture. And, it is noted that Fig. 3 of Suzuki shows relative positions of the aperture and peripheral circuit schematically . Applicant

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It is to be understood, of course, that the claim scope is not limited by the details of the described embodiments, which are referred to only to facilitate explanation.

has found nothing in Suzuki that would teach or suggest "a back side incident type fingerprint sensor..., wherein a distance, in a direction parallel to the semiconductor substrate, between the electric circuit on the front side of the semiconductor substrate and an edge of the opening on the back side of the semiconductor substrate is 0.303 times the thickness of the semiconductor substrate or more," as recited in Claim 1 (emphasis added).

A review of the other art of record has failed to reveal anything which, in Applicant's opinion, would remedy the deficiencies of the art discussed above, as a reference against Claim 1.

The other claims in this application are each dependent from one or another of the independent claims discussed above and are therefore believed patentable for the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, however, the individual reconsideration of the patentability of each on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicants respectfully request favorable reconsideration and early passage to issue of the present application.

Applicant's undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,

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